TRIAL

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ECCENTRIC LOADING RESPONSE IN ACHILLES TENDINOPATHY: A RANDOMIZED CLINICAL

Physiotherapy

KEY WORDS: VAS (Visual Analogue Scale), VISA-A Questionnaire, Achilles Tendinopathy.

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Introduction: Tendinopathy is a term used commonly to describe any painful condition occurring within or around a tendon. It can result from overuse and is experienced as pain with activity, focal tenderness to palpation, and decreased ability to tolerate tension, which results in decreased functional strength. Achilles tendinopathy is one of the most common tendinopathies which athelete and non-athlete individuals or recreational individuals suffer. Treatment of tendonitis begins with avoidance of aggravating movements. Other means of treatment include icing the injured tendon, ultrasound therapy, and physical therapy. To prevent and avoid tendonitis in the future, slowly increase the intensity and type of exercise. Eccentric loading have become an important therapeutic regimen and broadly used in case of tendinitis.

ABSTRACT

Material and Method: The study was of a single blind, randomized clinical trial with 30 subjects, 19 were female, 11 were male, and all subjects were assigned according to criteria (inclusion & exclusion) and carried out at physiotherapy OPD of CSS Hospital, Meerut. Severity of Achilles tendon & pain were assessed by using the VISA-A & VAS score respectively. The subjects were reassessed after completion of 3 weeks of intervention. The collected data were of mean and standard deviation of VISA-A questionnaire and VAS score and has been analyzed using SPSS software. The study was done to find out the efficacy of eccentric loading in reducing pain and severity in patients with Achilles tendinopathy.

Results: The results showed that there was significant difference in pain and severity with their VAS and VISA-A score (p=0.01) respectively.

Conclusion: Study concluded that the difference from 1st to 21st day in VAS & VISA-A score which shows that eccentric loading is effective to decrease pain and severity in patients with Achilles tendinopathy.

INTRODUCTION

Achilles tendinopathy is a prevalent overuse injury that usually presents between the ages of 30 and 60 years¹. Many causes of tendinopathy have been proposed, but the etiology has not yet been elucidated fully. Some proposed mechanisms include hypoxia, oxidative stress, hyperthermia, excessive apoptosis, inflammation, and matrix metalloproteinase imbalance². In the past, the term tendinitis was used widely because the etiology of this condition was thought to be associated with an inflammatory process. However, in most cases, the tendon involved shows no signs of inflammation but instead shows fibroblasts, vascular hyperplasia, hypercellularity, and disorganized collagen. The affected tendon also shows an increased infiltration of new blood vessels, which is known as neovascularization³. With these changes identified, tendinopathy has been accepted as a more appropriate term. In one study, histopathologic findings were similar when comparing patellar and Achilles tendinopathy⁴, which suggests that tendinopathy has a similar appearance at different body regions. The source of pain in tendinopathy is unknown. Theories on the causes of pain in tendinopathy suggest that a combination of mechanical and biochemical factors may play a role. Tendon degeneration with mechanical breakdown of collagen could theoretically generate pain. Chemical irritants and neurotransmitters also have been proposed as causing pain. These include lactate, glutamate, and substance P, all of which have been found to be elevated in tendinopathy. More recently, the nonneuronal cholinergic system has been implicated as a factor in chronic tendinopathy with evidence of both acetylcholine and a marked increase of muscarinic receptors; however its role in pain mechanisms is unclear⁵.

The current most common therapeutic exercise regimen for treatment of tendinopathy involves mechanically loading the painful or abnormal tissue with the use of eccentric exercises. Eccentric exercises involve lengthening of the musculotendinous unit while a load is applied to it. While eccentric muscle strengthening has been used for some time, until recently, little was known about how eccentric exercises result in decreased pain and normalization of the tendon in those with tendinopathy.

In recent years, eccentric training has gained popularity as an effective intervention for Achilles tendinopathy⁶. Eccentric muscle action is a lengthening muscle contraction. The muscle fiber (sarcomeres) cross bridges are at their maximal overlap at the beginning of the contraction; therefore, the eccentric contraction

generates more tension than both concentric and isometric contractions." It has been proposed that possible explanations for the positive effects of eccentric training on tendinitis might be either an effect of stretching, with a lengthening of the muscle-tendon unit, and consequently less strain during ankle joint motion, or hypertrophy and increased tensile strength in the tendon. It is this concept that may explain the possible remodeling effect of the tendon due to the eccentric exercise. Eccentric training has been identified as an important part of clinical rehabilitation of chronic tendinopathy, particularly of the Achilles tendon at the midportion⁷.

MATERIALS AND METHOD OUTCOME MEASURES

VISUAL ANALOGUE SCALE (VAS)

The visual analogue scale is one of the most basic pain measurement tools. It consists of a 10 cm line. The clinician can measure the place on the line and convert into it a score between 0 to 10 where 0 is no pain and 10 is bad as it could be 8 .

VISA-A QUESTIONNAIRE

The VISA-A aims to evaluate the clinical severity for patients with chronic Achilles tendinopathy. It is an easily self-administered questionnaire that evaluates symptoms and their effect on physical activity. It can be used to compare different populations with chronic Achilles tendinopathy, and facilitate comparisons between studies. It can be used to determine the patient's clinical severity and provide a guideline for treatments as well as for monitoring the effect of treatment⁹. The VISA-A is very user friendly, as it generally takes less than five minutes to complete, even for patients with chronic and severe symptoms. The questionnaire represents a valid, reliable and disease specific questionnaire to measure the condition of the Achilles tendon, but it is not a diagnostic tool. The final version of the questionnaire was named the Victorian Institute of Sport Assessment-Achilles Questionnaire.

Test Procedure

Self – administered questionnaire

The self-administered questionnaire was employed to assess severity of Achilles tendinopathy. This included a tendon-specific, VISA-A questionnaire. The questionnaire contains eight questions, covering three necessary domains: 1) pain, 2) functional status, and 3) activity (= three significant domains of dysfunction):

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Time to complete: 5 minutes.

Scoring: The maximum score that can be achieved on the question is 100, and would be the score of person who is completely asymptomatic. A lower score indicates more symptoms and greater limitation of physical activity.

Visual analogue scale (VAS)

VAS attempt to represent measurement quantities in terms of a straight line placed horizontally or vertically on paper. The endpoints of the line are labeled with descriptive or numeric terms to anchor the extremes of the scale and provide a frame of reference for any point in the continuum between intervals between the endpoints to assists the individual in grading responses. Commonly the entire visual analog line is 10 cm long. The patient is asked to bisect the line at a point representing self-reported position on the scale. The patient score is then obtained by measuring from the zero mark to the mark bisecting the scale.

Limitation of study

Research is done only among a particular age group. Only function and pain are measured. It is short duration study.

Variables

Dependent Variables: VAS, VISA-A Questionnaire

Independent Variables: Eccentric loading, Achilles tendinopathy

Study Design

This was a prospective, single-blind, randomized clinical trial.

Sample selection: According to the inclusion and exclusion criteria, the convenient sample of 30 subjects had randomly assigned in the study. This study was conducted in physiotherapy OPD of CSS Hospital, Subharti University Meerut.

Inclusion Criteria

- Age above 18 yrs.
- Both Male and female

Exclusion Criteria

- Any deformity of foot and ankle
- Any neurological problem and peripheral vascular disease
- History of fracture or trauma and surgery to lower limb
- Subject having calcaneal spur and planter fasciitis rheumatoid arthritis. generalized polyarthritis, Reiter syndrome, bleeding disorders, severe endocrine disease, tumor, local infection, advanced peripheral vascular disease, previous Achilles tendon surgery, ankle arthrodesis, hindfoot fracture, or leg-length discrepancy of more than one-half inch

Instrumentation

- Couch
- Stool
- Stationary (Pen, Pencil)
- VISA-A Questionnaire Form
- Consent Form

PROCEDURE

After getting their informed consent the subjects were randomly assigned. Subjects for research purpose were selected according to inclusion and exclusion criteria. According to VAS score and VISA-A questionnaire score, the data of pain and severity of Achilles tendinopathy was collected and table of selected variants was prepared and sorting of data was done. All patients were seen for two visits: initial evaluation, 1st day and 21st day but were instructed to follow the home exercise program for a total of 3 weeks. The home exercise program consisted of gastrocnemius, soleus, and hamstring self stretching, ice massage on the Achilles tendon twice a day (5-10 minutes). Patients were instructed to perform each stretch for three repetitions (30 seconds) twice day. The patients in the experimental group followed everything in the control protocol with the addition of eccentric loading exercises. In

this, the patient stood bearing weight on the involved foot in plantarflexion with the knee slightly bent; the patient then slowly lowered the heel into dorsiflexion to a count of five. The other leg could be used to assist the patient in returning to plantarflexion. Again, the patient lowered the heel to a count of five into dorsiflexion. If too weak to hold the single leg in plantarflexion, the patient stood with the heel off a step as high as possible (which might be neutral) and slowly lowered the heel to a count of five. Patients were instructed to perform exercises in two sets of 15 repetitions, twice daily. This protocol was used to accommodate the tolerance level of patients with various levels of activity, including those participating in recreational sports or those who performed manual labor. The data was analyzed by using SPSS and the value of **paired t-test** was collected and the significance of pvalue was checked and results were prepared. The post measurements were taken for the same variables.

DATA ANALYSIS

All analysis was obtained using SPSS version 21.0. Demo graphic data of the patients including range of motion and function were summarized. The dependent variables for the statistical analysis were VAS and VISA-A score. A base line data was taken and analyze. The paired **t-test** was used. A level of **0.01** was used to determine the statistical significance.

RESULTS

A sample of size 30 was studied individually for VAS and VISA-A score at base line. (Table-1) presents the Mean & S.D. and standard error of Mean for VAS and VISA-A score. The Paired 't' test was applied to find the significant difference in VAS and VISA-A score respectively which shows a significant difference at 1% level of significance (P<0.01).

TABLES

Table	1:	Mean,	Standard	Deviation	&	S.E.M.	of	VAS	score
and V	ISA	-A scor	e.						

S.NO.	TIME	(MEA	AN±SD)	SEM		
	PERIODS	VAS	VISA-A	VAS	VISA-A	
1.	AT 1ST DAY	4.63±0.99	65.66±4.99	0.18	0.64	
2.	AT 21ST DAY	1.1±0.99	87.66±7.21	0.18	0.93	

Table 2: Paired T – test, Average difference in Mean and Standard Deviation of pre and post score of VAS and VISA-A.

	PAIRED	DIFFE			
VARIABLES	MEAN	SD	SE	t-value	p-value
PRE TO POST VAS	2.86	2.03	0.37	3.54	<0.01(sig.)
PRE TO POST VISA-A	76.66	12.71	1.63	3.29	<0.01(sig.)

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GRAPH 1: PRE & POST values of MEAN Score of VAS.







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DISCUSSION

This study provides data for pain and severity in persons who stated they have Achilles tendinopathy. The data is sparse for the over 18 group since it was difficult to find people in this age group who could fit the criteria. This reflects the high prevalence of Achilles tendinopathy in advancing age groups. Random sampling to provide normative data from the population would be expected to include a high rate of people with Achilles tendinopathy, therefore, the difference between unaffected and normative data should widen as the age of interest increase.

In this study, data shows there is declination in pain score and severity score in patients with Achilles tendinopathy. Eccentric training also has been found to be effective in Achilles tendinopathy. The hypothesis that the eccentric loading would be effective in the treatment of Achilles tendinopathy was supported by this research. This study found that patients with Achilles tendinopathy experienced significant improvements with conventional physical therapy with eccentric loading.

Stanish et al. were the first in the medical literature to propose an eccentric exercise program for the treatment of tendinopathy, specifically the Achilles tendon¹⁰. Based on the research of Komi and Buskirk and other investigators, Stanish and Curwin understood that more force can be generated on the musculotendinous unit using maximum eccentric contractions than with concentric and isometric contractions, and they hypothesized that microtrauma of the tendon occurs during an eccentric load. In order for the injured tendon to be adequately rehabilitated, they postulated that the treatment program should include eccentric exercises in order to train the tendon to withstand loads that could have caused the initial damage. The protocol involved once-daily exercises, stretching, and a progressive increase in the speed of movements, which occurred over a 6-wk period. Their study demonstrated that an eccentric exercise program, in 200 patients with Achilles tendinopathy with a mean duration of symptoms for 18 months, led to complete relief in 44% of patients and marked improvement in an additional 43% with a mean follow-up period of 16 months¹¹. However, as with a number of studies using eccentric training, this study did not include a placebo control group.

Alfredson et al. was the first to perform a controlled study using eccentric exercises in patients with midportion Achilles tendinopathy. In this study of patients that had a mean duration of symptoms for 18 months, he compared an eccentric exercise program to conventional therapy followed by surgical intervention. His eccentric calf muscle exercise protocol involved using 3 sets of 15 repetitions with the knee fully extended and 3 sets of 15 repetitions with the knee partially flexed. This program was repeated twice daily, every day for 12 wk. producing patients' tendon pain during the exercises was expected, but patients were told that pain should not be progressive or disabling. Additional resistance was added (e.g., by wearing a back pack with weights) when the exercises became easier. Their study showed a high success rate for Achilles tendinopathy using this protocol ¹².

Overall, there was a reduction in pain and severity in Achilles tendinopathy over-18 age category, while there was a significant effect of eccentric loading in reducing pain and severity in Achilles tendinopathy respectively. Our results are consistent with other studies that have shown the eccentric training has an important role in Achilles tendinopathy.

CONCLUSION

The study states that the eccentric loading decrease pain and severity in patients with Achilles tendinopathy. It is concluded that the eccentric loading is effective in reduction of pain and severity in Achilles tendinopathy. Study conclude that the difference from 1^{st} to 21^{st} day in VAS and VISA-A score shows that eccentric loading is effective to decrease pain and severity. The study shows that the parameters utilized for the technique maneuvers were effective for decreasing pain and severity. This Study supports experimental hypothesis H1.The significant difference was present for VAS score, VISA-A score with respect to 1^{st} day.

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